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(54) Wheelchair frame and castor assembly

(57) A wheelchair frame comprises a base frame part (1, 2) with a plurality of wheels (3, 33), including two front wheels (3), wherein each of said front wheels can be driven by an electromotor (4). The base frame part carries at the back side a castor assembly (13) located in the centre and comprising a swivel axle (14) with a neutral straight on position, wherein means (22) are provided for exerting a rotation force on the swivel axle in the direction of the straight on position at rotation of the swivel axle out of the straight on position.

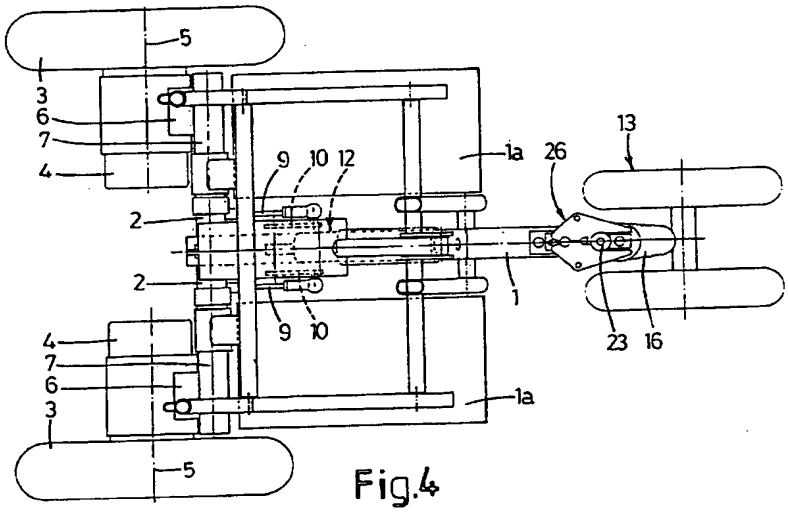

Fig.4

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Description

The invention relates to a wheelchair frame comprising a base frame part with a plurality of wheels including two front wheels, wherein each of said front wheels can be driven by an electromotor.

In the known wheelchair frame of this type two separate castors are provided at the backside of the base frame part. Although the use of driven front wheels provides the possibility to use relatively large front wheels whereby obstacles can be passed well, the manoeuvrability of the known wheelchair frame leaves to be desired. At higher speeds, i.e. faster than 6 km/h, the straight on stability of the wheelchair frame is bad. In the known wheelchair frame one tries to overcome this problem by a tachogenerator control of the driving motors and/or the application of a control of the castors. Thereby the known wheelchair frames become however relatively expensive and complicated. Further, the known wheelchair frame has the disadvantage that the batteries required as power supply of the electromotors are completely built in the wheelchair frame, whereby the batteries are difficult to access, usually only after removing a seat mounted on the wheelchair frame. Further the base frame part of the known wheelchair frame comprises generally at least four tubular elements whereby manufacturing is time consuming.

The invention aims to provide a wheelchair frame of the above-mentioned type wherein said disadvantages are obviated.

To this end the wheelchair frame of the invention is characterized in that the base frame part carries at the backside a castor assembly located in the centre and comprising a swivel axle with a neutral straight on position, wherein means are provided for exerting a rotation force on the swivel axle in the direction of the straight on position at rotation of the swivel axle out of the straight on position.

In this manner a wheelchair frame is obtained, the central castor assembly of which makes the wheelchair frame very manoeuvrable. Further, the wheelchair frame has an excellent straight on stability at high speeds while maintaining the high manoeuvrability of the wheelchair frame.

According to a preferred embodiment of the invention each front wheel is rotatably supported by a support arm rotatably connected to a transverse axle in such a manner that the rotation axis of the front wheels lies ahead of the transverse axle as seen in forward direction, wherein a common spring means is provided for both front wheels, said spring means being connected to the base frame part at one end and to both support arms at the other end. In this manner it is obtained that when braking the wheelchair frame will not gallop. Thereby the comfort for the user is increased and the stability of the wheelchair frame is guaranteed even at braking on downwardly sloping surfaces.

According to a favourable embodiment the spring means comprises a gas spring and a helical spring which are mounted in a telescoping housing. Thereby a spring means is obtained wherein the action of the gas spring can be adjusted to absorb the own weight of the complete wheelchair and a part of the weight of the user and the helical spring can be adjusted to an optimal spring comfort.

The invention further provides a castor assembly comprising a swivel axle with a neutral straight on position, which is for example suitable to be used in the described wheelchair frame but can also be advantageously used in an other type of wheelchair frame or in other moving constructions comprising castors.

According to the invention the castor assembly is characterized in that the swivel axle is provided with an eccentric which is substantially fittingly positioned between the spring legs of a fork in the straight on position, said fork being formed by two identical fork legs each comprising a half-round seating and being pressed with the seating on a bearing pin by a spring means. Thereby an excellent straight on stability of the castor is guaranteed with a relatively simple construction.

The invention will be further explained hereinafter by reference to the drawings in which embodiments of the wheelchair frame and the castor assembly according to the invention are shown.

Figs. 1-3 schematically show side views of an embodiment of the wheelchair frame according to the invention in different positions.

Fig. 4 is a top view of the wheelchair frame of figs. 1-3.

Figs. 5 and 6 show a more detailed top view of the castor assembly of the wheelchair frame of fig. 1 in two positions.

Fig. 7 is a partially shown cross-section of the castor assembly of the wheelchair frame of fig. 1.

Fig. 8 shows a cross-section of the spring means of the wheelchair frame of fig. 1.

Figs. 1-3 show side views of a wheelchair frame in different positions and fig. 4 shows a top view of this wheelchair frame. The wheelchair frame shown comprises a central beam 1 extending in driving direction and carrying a transverse axle 2 at the front side. The central beam 1 and the transverse axle 2 together form a base frame part of the wheelchair frame. The transverse axle 2 carries at each end a front wheel 3 which can be driven by an electromotor 4. Each wheel 3 is rotatable around a schematically indicated axis 5 and is rotatably connected with the transverse axle 2 by means of a support arm 6 and a bush 7, wherein the axis 5 lies ahead of the transverse axle 2 as seen in driving direction. A coupling arm 8 is attached to each bush 7 and the coupling arm 8 is connected to a lever 10 by a pulling rod 9. As shown in the top view of fig. 4, the levers 10 are mounted at both sides on the central beam 1 rotatably around an axis 11. The opposite end of the levers 10 is connected with one end of a spring means 12 which at its other end is connected to the central beam 1. In the described manner the spring means 12 forms a common spring means for the front wheels 3 lying centrally above the central beam

1 so that a very compact frame construction is obtained. The described construction of the wheelchair frame further shows the advantage that spaces 1a (see figs. 1 and 4) for the usual batteries for the power supply of the electromotors 4 are formed at both sides of the central beam 1, said spaces 1a being well accessible from the sides of the wheelchair frame. Checking and maintenance of the batteries is thereby easy, wherein it is not necessary for the user to leave the wheelchair.

The central beam 1 carries at its backside a castor assembly 13 comprising a swivel axle 14 slidably mounted in a bush 15 which is attached to the end of the central beam 1. The swivel axle 14 is slidable in the bush 15 against the action of a spring 16.

Fig. 1 shows the wheelchair frame in a not compressed position, wherein one end of the spring means 12 presses against a stop 17 of the central beam 1. Fig. 2 shows the wheelchair frame in a compressed position as caused by a user not shown. By the suspension of the front wheels 3 as described with the common spring means 12 it is obtained that the wheelchair frame will not gallop during braking but will rather move somewhat upwardly. This increases significantly the comfort of the user and also guarantees the stability of the wheelchair frame, especially during braking on a downwardly sloping surface.

In the embodiment shown the base frame part supports a seat frame part 18 with adjustable seat angle and connected to the base frame part by means of front rods 19 and back rods 20. A spindle motor 21 is provided for adjusting the seat angle of the seat frame part 18. In figs. 1 and 2 the seat frame part is adjusted in a relatively flat position and in fig. 3 in the most rearwardly sloping position. For a further explanation of the adjustable seat frame part reference is made to EP-A- 0 512 650 of the same applicant.

The central castor assembly 13 provides for a very high manoeuvrability of the wheelchair frame. In order to provide a very high straight on stability also at high driving speeds, i.e. faster than 6 km/h, the castor assembly 13 comprises means 22 which at rotation of the swivle axle 14 from a neutral straight on position shown in fig. 5 into for example the position shown in fig. 6, exerts a rotation force on the swivel axle 14 in the direction of the straight on position. These means comprises an eccentric mounted on the swivel axle 14 made as a ball bearing 23 attached on the swivel axle 14 by means of a connecting clamp 24. In the neutral straight on position the ball bearing 23 lies substantially fittingly between the spring legs 25 of a fork 26. This fork 26 is mounted on a support plate 27 which is rotatably supported by the swivel axle 14 by means of a ball bearing 28 (see fig. 7). This support plate 27 has a pin 29 slidably mounted in the central beam 1 in the direction of movement of the swivel axle 14 during compressing the wheelchair frame, said pin fixing the support plate 27 with respect to the central beam in rotation direction of the swivel axle 14. The support plate 27 carries a bearing pin 30 for the fork legs 25. These fork legs 25 are identical and each comprise a substantially half-round seating 31, wherein the fork legs 25 are pressed on the bearing pin 30 with the seatings 31 by two springs 32 lying above and below the fork legs, respectively.

During driving straight on wherein the swivel axle 14 is in the neutral straight on position as shown in fig. 5, the fork legs 25 maintain the swivel axle 14 in this straight on position so that the wheelchair has a good straight on stability. When the electromotors 4 are controlled in a usual manner for taking a bend, the swivel axle 14 can easily rotate in the bush 15, for example into the position shown in fig. 6, wherein one fork leg 25 is pressed away against the action of the springs 32 by the ball bearing 23. When one drives straight on again, the fork leg 25 presses the swivel axle back into the neutral position.

As shown in the drawings, the castor assembly 13 comprises two wheels 33 lying at a short distance from each other with a common axle 34 wherein the axle 34 is received in a bush 35. This bush 35 is connected to the swivel axle 14 through a schematically indicated support 36 and a schematically indicated longitudinal shaft 37. The axle 34 is rotatable around the longitudinal shaft 37 which is aligned with the central beam 1.

Fig. 8 shows a cross-section of the spring means 12. As shown in fig. 8, the spring means 12 comprises a gas spring 38 and a helical spring 39 which are mounted in the telescoping housing 40. This housing 40 on one side rests with a seating 41 on a ball 32 attached to the central beam 1. The other side of the housing 40 is rotatably connected with the levers 10. The gas spring 38 provides a force which is sufficient for taking the weight of the wheelchair frame and a part of the weight of the user so that the helical spring 39 can be adjusted for providing spring comfort for the user. The spring force of the helical spring 39 and the spring force of the spring 16 are mutually adjusted in such a manner that the central beam 1 will move substantially vertically up and down during compressing the wheelchair frame.

It is noted that the castor assembly 13 with the means 22 for providing a high straight on stability can also be used at another type of wheelchair frame or at other types of moving constructions provided with castors.

The invention is not restricted to the above-described embodiment which can be varied within a number of ways within the scope of the claims.

Claims

1. Wheelchair frame comprising a base frame part (1, 2) with a plurality of wheels (3, 33), including two front wheels (3), wherein each of said front wheels can be driven by an electromotor (4), **characterized in that** the base frame part (1, 2) carries at the back side a castor assembly (13) located in the centre and comprising a swivel axle (14) with a neutral straight on position, wherein means (22) are provided for exerting a rotation force on the swivel axle in the

direction of the straight on position at rotation of the swivel axle out of the straight on position.

2. Wheelchair frame according to claim 1, **characterized in that** the swivel axle (14) is provided with an eccentric (23) which is substantially fittingly positioned between the spring legs (25) of a fork (26) in the straight on position.

3. Wheelchair frame according to claim 2, **characterized in that** the eccentric (23) is formed by a ball bearing attached to the swivel axle (14) by means of a connection arm (24).

4. Wheelchair frame according to claim 2 or 3, **characterized in that** the fork (26) is formed by two identical fork legs (25) each comprising a half-round seating (31) and being pressed on a bearing pin (30 with the seating by a spring means (32).

5. Wheelchair frame according to claims 2, 3 or 4 wherein the wheels (3, 33) are spring mounted in the base frame part (1, 2), **characterized in that** the swivel axle (14) is slidably borne in a bush (15) against the action of a spring (16), said bush being attached to the base frame part (1, 2) in the centre, wherein the fork (26) is rotatably mounted on the swivel axle (14) by means of a support plate (27) which is fixed in rotation direction with respect to the base frame part by means of a pin (29) slidably guided in the base frame part.

6. Wheelchair frame according to anyone of the preceding claims, **characterized in that** the castor assembly (13) comprises two wheels (33) lying at a short distance from each other with a common axle (34) connected substantially in the middle between the wheels to a longitudinal shaft (37) aligned with the centre line of the base frame part (1, 2) and connected to the swivel axle (14), wherein the axle (34) of the wheels is rotatable around the longitudinal shaft.

7. Wheelchair frame according to anyone of the preceding claims wherein the wheels (3, 33) are spring mounted in the base frame part (1, 2), **characterized in that** each front wheel (3) is rotatably supported by a support arm (6) rotatably connected to a transverse axle (2) in such a manner that the rotation axis (5) of the front wheels (3) lies ahead of the transverse axle (2) as seen in forward direction, wherein a common spring means (12) is provided for both front wheels, said spring means being connected to the base frame part (1, 2) at one end and to both support arms at the other end.

8. Wheelchair frame according to claim 7, **characterized in that** the base frame part (1, 2) comprises a central beam (1) extending in the centre from the front side to the back side and carrying the transverse axle (2) at the front side, wherein the spring means (12) is mounted in the centre above the central beam and is connected to one end of levers (10) pivotably mounted at each side of the central beam, said levers being connected to a corresponding support arm (6) at their other end.

9. Wheelchair frame according to claim 8, **characterized in that** each support arm (6) is rotatably mounted on the transverse axle (2) by means of a bush (7), wherein a coupling arm (8) is attached to each bush (7), said coupling arm being connected to the corresponding lever (10) by means of a pulling rod (9).

10. Wheelchair frame according to claim 7, 8, or 9, **characterized in that** the spring means (12) comprises a gas spring (38) and a helical spring (39) which are mounted in a telescoping housing (40) which on one side rests with a seating (41) against a ball (42) mounted on the central beam (1) and on the other side is rotatably connected to the levers (10).

11. Castor assembly comprising a swivel axle (14) with a neutral straight on position, **characterized in that** the swivel axle (14) is provided with an eccentric (28) which is substantially fittingly positioned between the spring legs (25) of a fork (26) in the straight on position, said fork being formed by two identical fork legs (25) each comprising a half-round seating (31) and being pressed with the seating on a bearing pin (30) by a spring means (32).

12. Castor assembly according to claim 11, **characterized in that** the fork (26) is mounted on a support plate (27) which is rotatably mounted on the swivel axle (14).

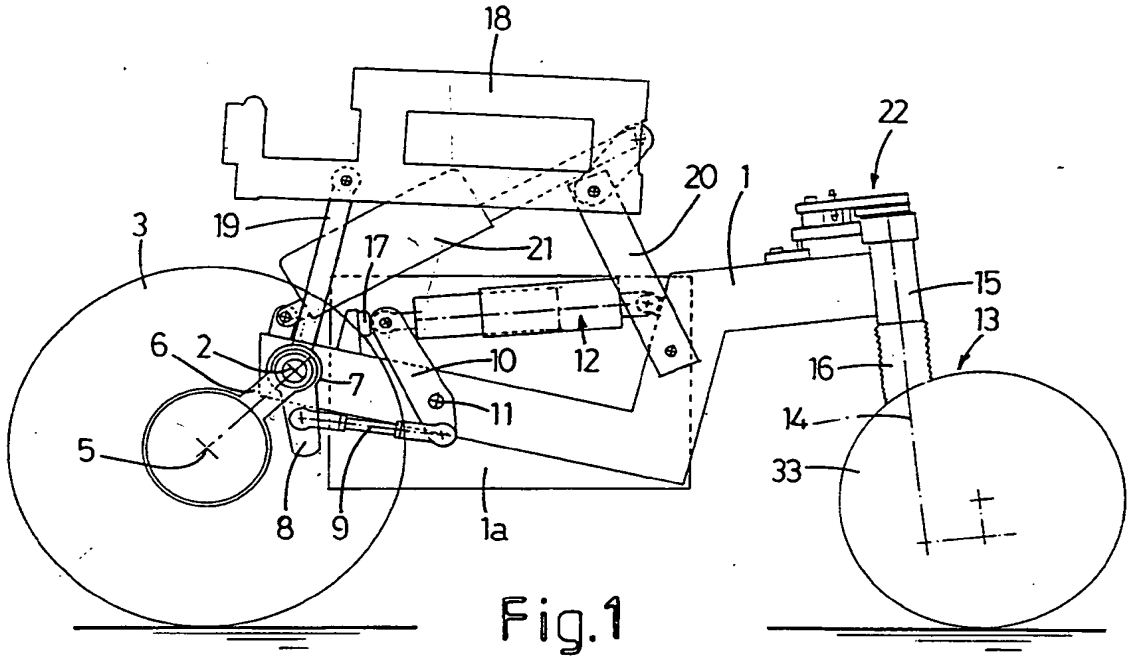

Fig.1

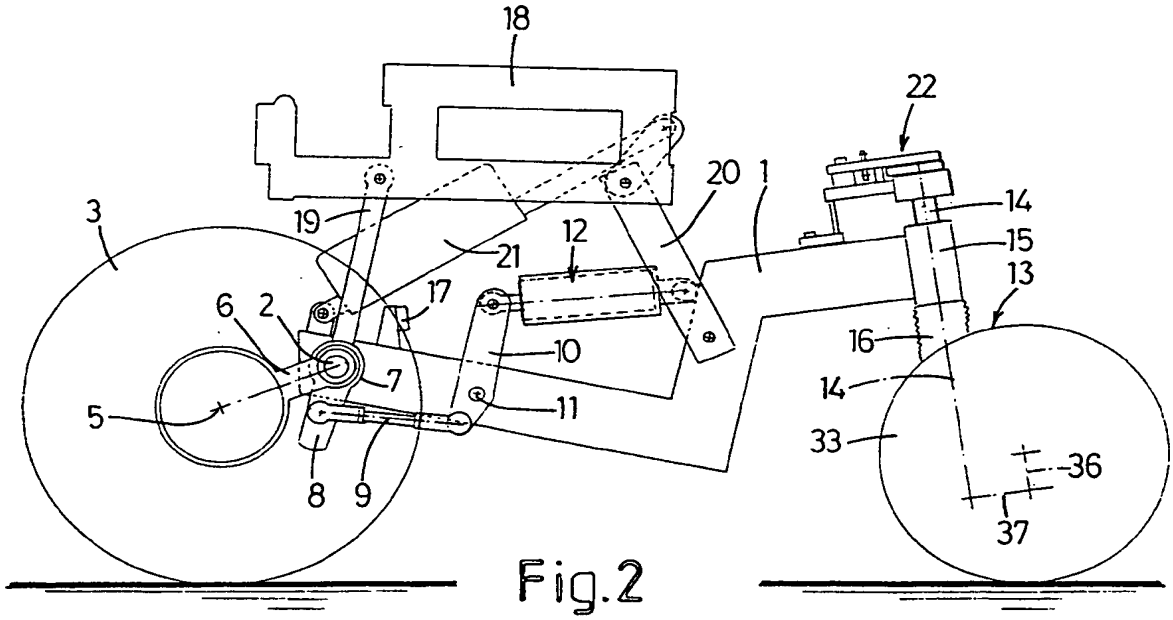

Fig.2

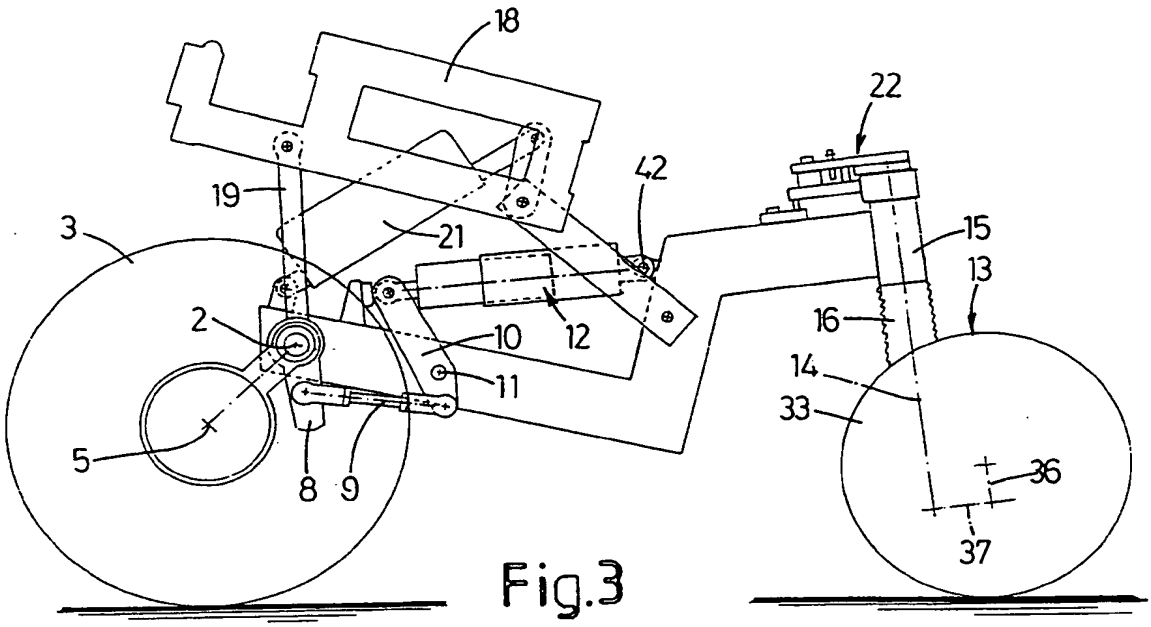
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Fig.3

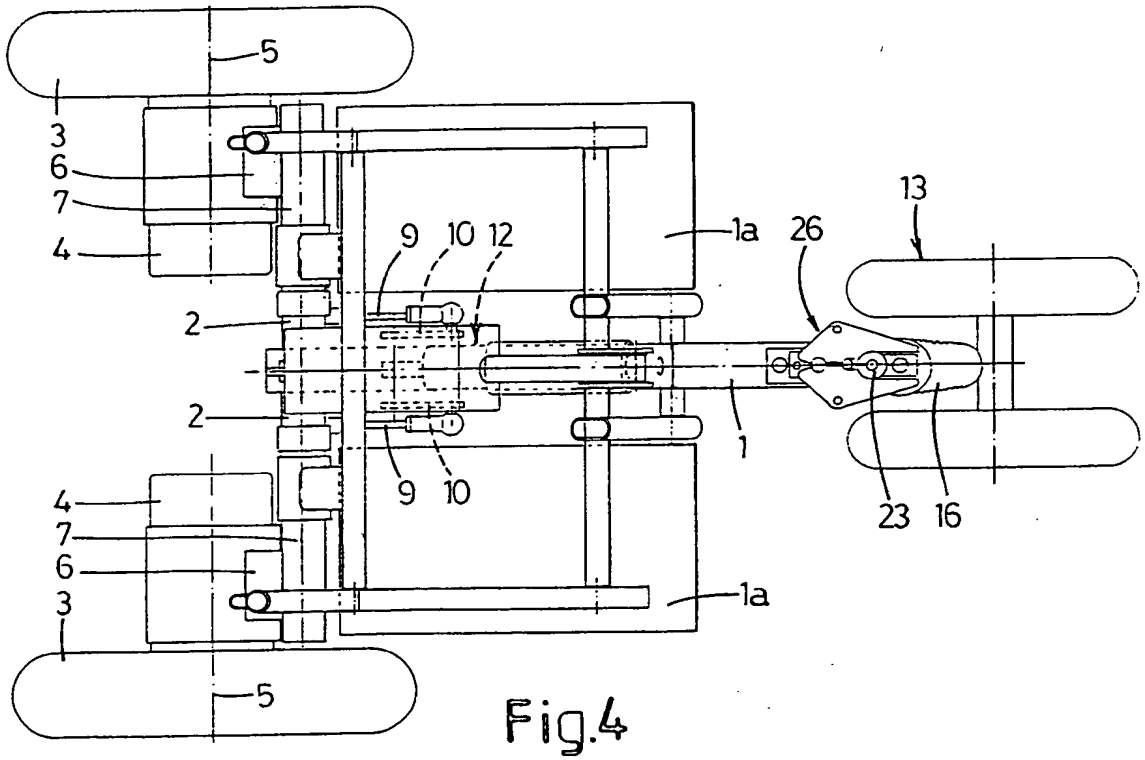
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Fig.4

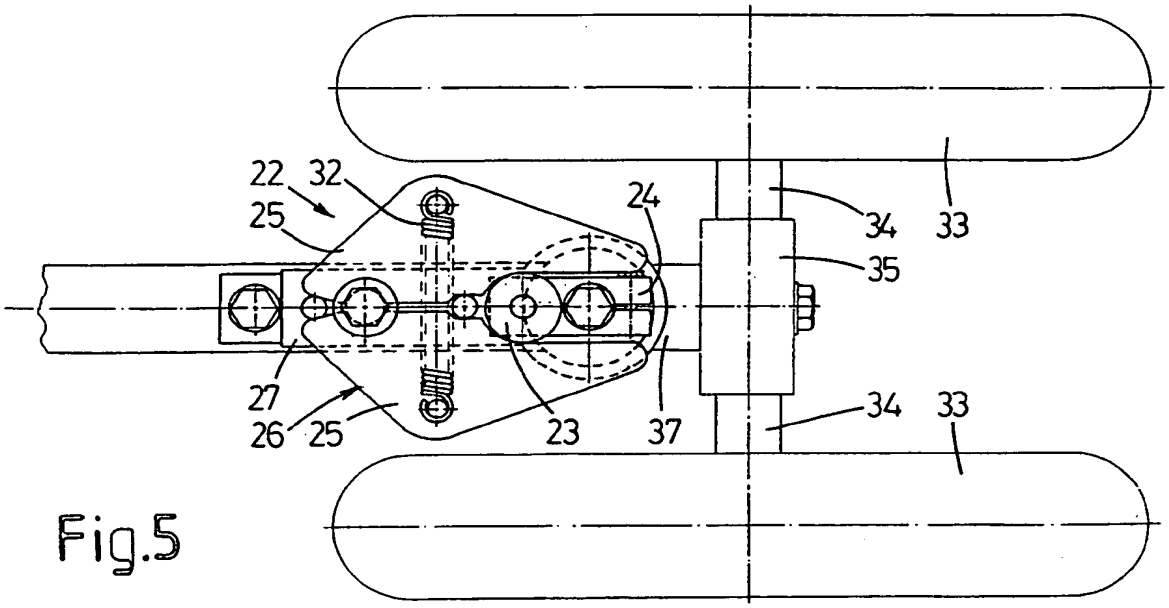

Fig.5

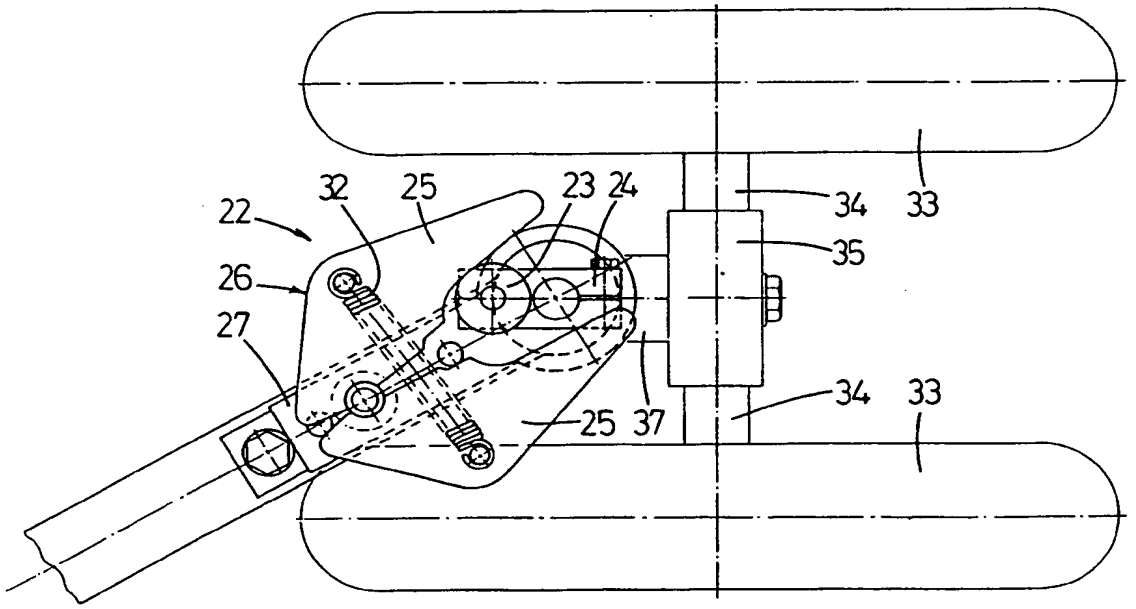

Fig.6

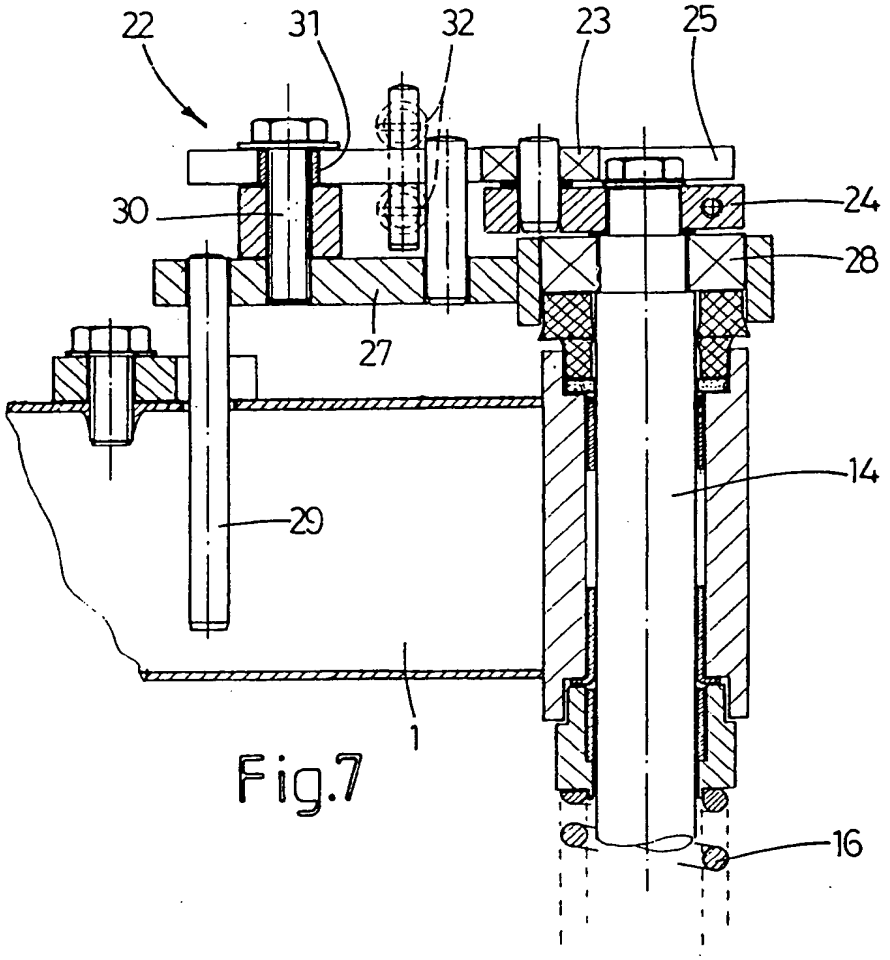

Fig.7

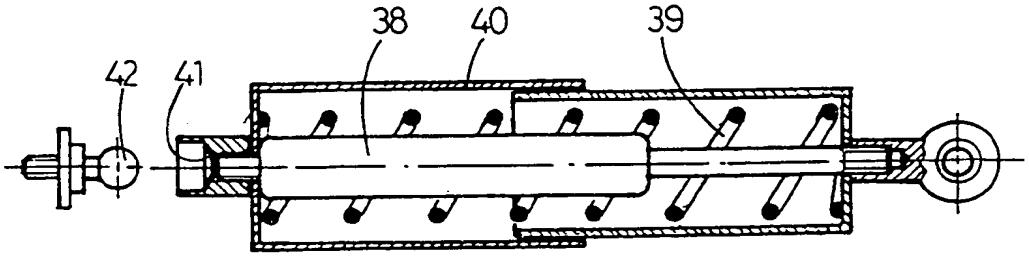

Fig.8

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EUROPEAN SEARCH REPORT

Application Number
EP 95 20 2638

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y	WO-A-88 10109 (INM INDUSTRITEKNIK AB) 29 December 1988 * page 3, line 11 - line 16; figures 3,4 *	1,2	A61G5/04 B60B33/02
Y A	US-A-3 990 716 (DOWS) * column 2, line 44 - line 57; figures *	1,2 11	
A	GB-A-2 275 029 (ROSE ET AL.) 17 August 1994 * page 5, line 1 - line 14; figures *	1	
A	US-A-3 064 744 (JENNINGS) 20 November 1962 * column 3, line 19 - line 63; figures *	1	
A	US-A-4 280 246 (CHRISTENSEN) 28 July 1981 * figures *	3,4,11	
A	POLYTECHNISCH TIJDSCHRIFT WERKTUIGBOUW, no. 8, 1993 NL, page 21 XP 000384929 'gaaf gebruiksvriendelijk karretje' * the whole document *	6	
A	WO-A-94 13241 (RICHARD VAN SEENUS NEDERLAND B.V.) 23 June 1994 * abstract; figures *	5,7-10	TECHNICAL FIELDS SEARCHED (Int.Cl.6) A61G B60B B62K B62D
A	FR-A-1 120 072 (LIOUS) * the whole document *	2,11	
A	FR-A-2 479 104 (SAXBY) 2 October 1981 * page 2, line 29 - page 3, line 22; figures *	2,11	
P,A	WO-A-95 08449 (MULTICONTROL LTD.) 30 March 1995 * page 4, line 15 - page 5, line 31; figures *	2,11	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	7 February 1996	Godot, T

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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